

Alabama.—Birmingham, 6th.  
Arkansas.—Lead Hill, 3d.  
Colorado.—West Las Animas, 3d; Pike's Peak, 12th, 19th.  
Dakota.—Fort Sisseton, 26th, 28th, 29th.  
Indiana.—Laconia, 3d.  
Kansas.—Fort Scott, 2d; El Dorado, 2d, 3d; Ninnesciah, 3d.  
Kentucky.—Louisville, 2d.  
Maine.—Eastport, 6th, 7th; Bar Harbor, 7th.  
Massachusetts.—Heath, 6th; Princeton, 6th, 7th.  
Michigan.—Marquette, 24th.  
Missouri.—Springfield, Centreville, and Lamar, 3d.  
Nebraska.—Fort Niobrara, 25th, 28th.  
New Jersey.—Clayton, 4th; Beverly, 4th, 5th.  
New York.—Le Roy, Humphrey, and Rochester, 6th.  
Ohio.—Wauseon, 1st.  
Oregon.—Linkville, 1st.  
Pennsylvania.—Wellsborough and Philadelphia, 4th; Fallington and Pittsburg, 5th.  
Texas.—El Paso, 12th.

#### TEMPERATURE OF WATER.

The following table shows the highest and lowest temperatures of water observed at the several stations; the monthly ranges of water temperature; the average depth at which the observations were made; and the mean temperature of the air:

*Temperature of water for April, 1886.*

Station.	Temperature at bottom.		Range.	Average depth, feet and tenths.	Mean temperature of the air at station.
	Max.	Min.			
Atlantic City, New Jersey	55.9	41.8	14.1	9.5	48.0
Alpena, Michigan*	46.8	30.9	15.9	12.7	38.1
Augusta, Georgia	71.0	53.8	17.2	13.3	63.1
Baltimore, Maryland	63.3	44.8	18.5	10.3	54.6
Block Island, Rhode Island	47.5	36.5	11.0	8.1	45.2
Boston, Massachusetts	52.6	39.4	13.2	20.5	47.7
Buffalo, New York	53.7	38.1	15.6	9.6	46.3
Canby, Fort, Washington Ter	55.2	47.3	7.9	16.2	48.2
Cedar Keys, Florida	75.4	59.3	16.1	8.5	65.8
Charleston, South Carolina	68.9	58.7	10.2	38.0	62.4
Chicago, Illinois	53.7	35.6	18.1	8.1	49.1
Chincoteague, Virginia	63.1	46.8	16.3	3.2	51.9
Cleveland, Ohio*	57.7	35.3	22.4	14.0	49.1
Detroit, Michigan	51.3	32.3	19.0	26.8	50.6
Duluth, Minnesota					
Eastport, Maine	40.1	35.0	5.1	16.6	40.1
Escanaba, Michigan*	45.7	37.9	7.8	18.2	38.0
Galveston, Texas	75.0	59.3	15.7	13.0	66.5
Grand Haven, Michigan	66.0	36.6	29.4	19.0	47.3
Indianola, Texas†					
Jacksonville, Florida	75.7	64.0	11.7	18.0	66.5
Key West, Florida	81.0	75.3	5.7	19.5	74.5
Mackinaw City, Michigan*	37.9	33.2	4.7	10.0	38.0
Macon, Fort, North Carolina	67.8	57.5	10.3	10.8	60.6
Milwaukee, Wisconsin*	52.6	46.3	6.3	8.0	43.4
Mobile, Alabama	68.5	59.0	9.5	18.4	63.9
New Haven, Connecticut	54.0	39.0	5.0	16.6	48.3
New London, Connecticut	49.5	37.6	12.9	12.7	48.1
New York City	52.5	40.0	12.5	18.5	50.3
Norfolk, Virginia	62.7	47.2	15.5	15.8	56.1
Pensacola, Florida	70.9	61.2	8.7	17.8	65.3
Portland, Maine	48.4	35.8	12.6	16.1	44.7
Portland, Oregon	54.9	48.9	6.0	51.1	49.9
Sandusky, Ohio	61.0	33.8	27.2	10.8	48.3
Sandy Hook, New Jersey	51.3	37.5	13.8	12.3	48.7
San Francisco, California†					
Savannah, Georgia	70.3	55.1	15.2	10.1	64.7
Smithville, North Carolina	69.4	57.6	11.8	10.8	60.9
Toledo, Ohio	70.4	34.2	36.2	13.1	49.0
Wilmington, North Carolina	70.6	56.3	14.3	11.5	62.1

\* Observations interrupted by ice; see text. † Observations temporarily suspended.

Observations were interrupted by ice throughout the month at Duluth, Minnesota. Observations were also interrupted by ice at Mackinaw City, Michigan, from the 1st to the 26th; Escanaba, Michigan, from the 1st to 25th; Alpena, Michigan, from the 1st to the 6th.

#### WINDS.

The most frequent directions of the wind during April, 1886, are shown on chart ii by the arrows flying with the wind; they are also given in the tables of miscellaneous meteorological data. In the Lake region, and along the Atlantic coast from Boston, Massachusetts, to Key West, Florida, the prevailing winds were mostly from the northeast; in the Gulf States

and southern half of the Mississippi Valley they were generally from the southeast; in the north Pacific coast region they were southerly, while along the coast of California they were north-westerly. In the Rocky Mountain districts they were variable.

#### HIGH WINDS.

[In miles per hour.]

Wind-velocities of fifty or more miles per hour were reported during the month, as follows:

Mount Washington, New Hampshire, 110, sw., 1st; 80, nw., 2d; 72, nw., 3d; 90, se., 6th; 53, se., 7th; 77, nw., 9th; 80, nw., 10th; 70, nw., 11th; 62, w., 12th; 60, nw., 13th; 56, nw., 21st; 50, w., 22d; 82, w., 23d; 78, w., 24th; 50, nw., 26th.

Pike's Peak, Colorado, 88, w., 7th; 54, sw., 18th; 52, nw., 26th; 64, w., 27th; 52, nw., 29th.

Cape Mendocino, California, 60, se., 1st; 57, se., 8th; 70, se., 9th; 56, se., 12th; 65, se., 14th; 65, se., 15th; 80, se., 16th.

Valentine, Nebraska, 52, s., 21st; 52, n., 25th; 50, n., 26th.

West Las Animas, Colorado, 50, s., 8th.

Dodge City, Kansas, 52, se., 22d.

Eastport, Maine, 70 (estimated), ne., 7th.

Boston, Massachusetts, 51, e., 6th.

Fort Maginnis, Montana, 62, nw., 15th.

Sandy Hook, New Jersey, 60, e., 6th.

Fort Elliott, Texas, 50, se., 23d.

#### LOCAL STORMS AND TORNADOES.

Los Angeles, California: a thunder-storm, with hail and high wind, passed over this place on the 11th. Considerable damage was done to the track of the Southern Pacific Railroad between Los Angeles and San Fernando, causing a delay of trains. A number of cellars were flooded. The grain crop suffered severely, being beaten down by the hail. This storm is reported to have been equally as severe at San Diego.

Abilene, Texas: a heavy thunder-storm, accompanied by hail, passed over this place on the 12th, lasting from 8.45 to 10 p. m. The ground was covered with hail, measuring from one-fourth to an inch in diameter. The wind being light, but little damage resulted from the storm.

Nicolaus, Sutter county, California: on the 13th, at 7.45 p. m., a heavy thunder-storm occurred, which is an unusual phenomenon for this place. The track of storm was about twelve miles wide. Five miles below here the precipitation was in the form of hail, which did not all melt until noon next day. Farmers report many wild geese picked up on the plains, killed either by hail or lightning.

Sauk Rapids, Saint Cloud, and Rice Station, Minnesota, and vicinity, were visited on the afternoon of the 14th, shortly after 4.00 p. m., by one of the most destructive tornadoes that has ever been reported in the Northwest. When first seen it was in the shape of a long and exceedingly black, funnel-shaped cloud, surrounded on all sides by perfectly clear sky, the tube of the funnel having a spiral shape and touching the ground. The general course of the tornado was from the southwest towards the northeast. When it had advanced until it was over the towns the air was so dark that it was impossible to see more than five feet.

The description below of the tornado as it appeared at Saint Cloud is given by an eye witness:

The tornado must have formed rapidly, and just about over the lake, as it was there when first noticed. It was very black, and seemed to be constantly in motion. It was moving rapidly across the lake when first seen, was flat and oval in shape, with a sort of spiral at each of the extremities, one extending upward and the other downward. It was peculiar in appearance, and I watched it closely. After having passed across the lake it seemed to stop. The movement resembled that of a fan opening and closing, and it remained stationary for some seconds. Almost instantly the form changed. Instead of lying flat, it seemed to turn on end and the spirals that ran up from the other end formed a part of a big double spiral. It had a movement that was peculiar, as if there was a commotion within it. The course was rapid and as soon as the big spiral was formed it began moving at a terrific rate in a course that was somewhat zigzag. It dropped down to the ground, and I saw the entire work of ruin. The course of the tornado after crossing the river was rather sinuous, though hardly as much so as before. It swept across the country, and in five minutes

from the time of reaching Sauk Rapids the work of destruction was done. There were two clouds at first that came together directly over the lake, and then turned on end and swept onward.

In the track of the tornado at Sauk Rapids, stood the Manitoba freight house and cars filled with freight. The tornado lifted the heavy cars from the tracks, and cast them in shapeless masses. The freight house was totally wrecked. Iron rails were torn from the track and twisted like wires; \$3,000 worth of freight was whirled through the air and thrown into heaps and scattered by piecemeal over an area of a quarter of a mile. Fifteen freight cars were demolished. Operators in the telegraph office and employes at the freight depot saw the tornado coming and fled to the cellars and thus escaped. Not a single business house was left standing in the main street, and many dwellings were demolished. The court house was left a heap of ruins, and several of the county officers killed. The Union School House, two churches, the post-office, a flour mill, and a large machine shop were completely destroyed in about forty seconds. The loss of property was estimated at \$250,000, the town being almost completely destroyed. A heavy iron truss-bridge across the Mississippi at Sauk Rapids was wrecked, and parts of it carried in the cloud a considerable distance before being dropped. Men, women, and children, as well as horses and cattle, were lifted into the air and dashed to the ground. The number of persons killed in the towns named above was at least fifty-five, and three times that number were injured. The bodies are described as presenting, in many cases, a blackened appearance, as if they had been scorched, while frequently the clothing was completely torn from them. Every description of this tornado speaks of it as being accompanied by a roaring and peculiar crackling sound, which became deafening as it approached, also that the black, oval-shaped cloud with a tube turning on the ground was seen by a number of persons, whose lives were saved by retreating to cellars and other underground apartments. The track of the tornado was about twenty miles long and twenty rods wide; immense damage was done to farm property, orchards, forests, and stock. During the passage of the tornado, and afterwards, rain fell in torrents.

On the afternoon and night of the same day, the 14th, on which the above tornado occurred, unusually destructive local storms and tornadoes occurred in widely separated parts of the country, as will be seen by the following:

Carson, Pottawottamie county, Iowa: on the 14th a tornado passed over Wheeler Grove, a village seven miles southeast of this place, completely demolishing the Mormon church and wrecking many other buildings.

Aurora, Wise county, Texas: this county was visited by a destructive tornado on the night of the 14th, which swept every thing before it, cutting a broad swath through the forests encountered in its course. A number of residences were demolished and twelve persons injured. Great damage was done to farm property, and considerable live stock killed. The tornado travelled from the southeast toward the northwest.

The following description of this storm is given by an observer:

About 9 o'clock a heavy rain set in, followed by an electrical display and hail storm. Suddenly, during a brief lull in the storm, the distant roar of an on-coming tornado was distinctly heard at this place. The inhabitants were panic-stricken. The night was pitch dark; the dull roar lasted a quarter of an hour, growing gradually less and less. Over a dozen farm houses were demolished. Occupants in nearly every residence sustained severe injury. So far as heard from, no lives were lost, but several injuries, it is believed, will prove fatal. The loss of property is very great, being estimated at over \$100,000 in Wise county alone. The path of the tornado proper was only two hundred yards in many places, but everything was leveled to the earth. For fifteen miles the track was covered with ruins of residences and barns. Many horses, cattle, and sheep in barns or field were killed.

Atchison, Kansas: a heavy rain and wind storm swept over the northern and northwestern parts of the state on the night of the 14th, prostrating telegraph poles and doing considerable damage to farm property. Within a few miles of Wetmore, on the Central Branch Railroad, a small tornado formed,

moving in a northeasterly direction and demolishing several farm houses.

Scott county, Missouri: a tornado occurred in the southeastern part of this county on the afternoon of the 14th, killing several persons and destroying much property. This is reported to have been a very severe tornado, but fortunately it passed through a thinly settled country.

Vicksburg, Mississippi: a severe thunder-storm, moving from southwest to northeast, passed over this place on the night of the 15th and 16th. The clouds floated very near the surface of the earth, affording a brilliant display of lightning. Several houses were struck and set on fire by the electric discharge.

Shreveport, Louisiana: at 2.30 on the 17th a very severe thunder-storm, accompanied by hail, began. The lightning was vivid and seemed to color the whole sky. West of the town the hail was very disastrous to market gardens, fruit trees, and cotton plants. Over a tract of country three miles long by one-half mile in width the damage was serious. The general course of the storm was from northwest to southeast. In some places the hail was seven inches deep, and from the size of a pea to three-fourths of an inch in diameter. The exterior of the stones presented the appearance of many minute ones massed together.

Salina, Saline county, Kansas: a hail and thunder-storm occurred on the 22d. The ground was completely covered with hail to a depth of two inches; owing to the strong wind it drifted in places five inches deep.

Fort Worth, Tarrant county, Texas: on the 25th a destructive wind storm, accompanied by rain and hail, swept over this place. The storm began at 7 p. m., continuing for about an hour. Stores were unroofed and stables and shops were blown down in several parts of the city. The damage was estimated at \$20,000.

Akron, Hale county, Alabama: a very disastrous tornado occurred in this vicinity on the 25th. The telegraph wires were thrown down, many houses demolished, trees were uprooted, and the entire section was devastated.

Fort Smith, Arkansas: a destructive hail and wind storm visited this place on the 25th. Four small houses were demolished, and forty buildings were damaged, principally by hail. The lowest estimate of the value of property destroyed is \$25,000. This storm lasted from 8.30 to 10 p. m., the precipitation during that time being 2.32 inches. The hail was larger in size and quantity, and more severe in its effects, than any known to have fallen here since the establishment of the Signal Service station; it covered the ground to a depth of about two inches and measured from one-quarter to one-half inch in diameter. The storm was accompanied by continuous sheet lightning and low, rumbling thunder.

Pensacola, Florida: during the 28th a gale and thunder-storm occurred. The wind reached a maximum velocity of thirty-three miles at 9.45 a. m. Considerable damage was done to shipping; thousands of dollars worth of lumber was blown into the bay.

Mississippi City, Harrison county, Mississippi: great damage was done north of this town, by a storm having the characteristics of a tornado, on the 28th. A substantial dwelling recently built, with out-houses, was completely demolished. The storm moved in a path half a mile wide, destroying large quantities of timber.

The following is a summary of the tornadoes of April, 1886, as reported by special tornado observers:

Near Atlantic, Cass county, Iowa: 14th, 4.30 p. m.; direction of path southwest to northeast.

Near Brockway, Stearns county, Minnesota: 14th, 4 p. m.

Phillips, Hamilton county, Nebraska: 14th, 6.15 p. m.; storm lasted from three to five minutes.

Bartlett, Ramsey county, Dakota: 16th; passed north of town during the afternoon.

Near Bedford, Taylor county, Iowa: 14th, 8.30 p. m.; course of storm a little east of north; cloud funnel-shaped; rotary motion against the hands of a watch, face upwards; six people injured; width of path one hundred and fifty feet.

Near Wetmore, Nemaha county, Kansas: 14th; during the night; course southwest to northeast.

Three miles southwest of Fonda, Pocahontas county, Iowa: 14th, 3.30 p. m.; course northeast; cloud funnel-shaped.

Sidney, Fremont county, Iowa: 14th, 4 p. m.; course southwest to northeast.

Shubert, Richardson county, Nebraska: 14th, p. m.

Island Ford, Rutherford county, North Carolina: 15th; evening; course southwest to northeast.

Near Alexandria, Douglas county, Minnesota: 14th, p. m.

Near Griswold, Cass county, Iowa: 14th, 4 p. m.; course north-northeast; much stock killed; fourteen dwellings, eighteen barns, and three school-houses destroyed.

Coon Rapids, Carroll county, Iowa: 14th, 5.05 p. m.; course north-northeast; cloud funnel-shaped, whirling against the hands of a watch; thirty-two buildings destroyed.

Story City, Story county, Iowa: 14th, 5.10 p. m.; course north 30° east; cloud funnel-shaped, whirling contrary to the movement of the hands of a watch; weather very warm and oppressive before the storm.

Saint Cloud, Stearns county, and Sauk Rapids, Benton county, Minnesota: 14th, 4.27 p. m.; course of storm north-northeast; cloud funnel-shaped; very heavy rain fell before and after the passage of the tornado cloud; air preceding storm sultry and oppressive; rotation of cloud from right to left; two hundred and fifty buildings destroyed; seventy-four persons killed, and one hundred and thirty-six wounded; loss of property about \$400,000.

Two miles south of Rome, Wise county, Texas: 14th, 10.30 p. m.; course of storm north-northeast; temperature 92° at noon; weather very oppressive; hail and rain fell before the tornado cloud approached.

Six miles southwest of Skidmore (Burr Oak Grove), Nodaway county, Missouri: 14th, 7.30 p. m.; course southwest to northeast; six persons killed, and ten wounded; much stock killed, and many buildings destroyed.

Lenox, Taylor county, Iowa: 14th, about 6.30 p. m.; several persons killed. Jamestown, Dakota: 14th, during the afternoon.

#### NAVIGATION.

In the following table are shown the danger-points at the various river stations; the highest and lowest depths for April, 1886, with the dates of occurrence, and the monthly ranges:

*Heights of rivers above low-water mark, April, 1886.*

[Expressed in feet and tenths.]

Stations.	Danger-point on gauge.	Highest water.		Lowest water.		Monthly range.
		Date.	Height.	Date.	Height.	
<i>Red River:</i>						
Shreveport, Louisiana.....	29.9	29	18.3	4, 5, 9, 10	15.3	3.0
<i>Arkansas River:</i>						
Fort Smith, Arkansas.....	22.0	19	12.9	25	6.1	6.8
Little Rock, Arkansas.....	23.0	21	14.1	11	7.7	6.4
<i>Missouri River:</i>						
Yankton, Dakota.....	24.0	14	16.5	2, 3	9.5	7.0
Omaha, Nebraska.....	18.0	15	9.3	21, 22, 26	7.7	1.6
Leavenworth, Kansas.....	20.0	17	14.1	28	9.8	4.3
<i>Mississippi River:</i>						
Saint Paul, Minnesota.....	14.5	1	8.2	11	4.4	3.8
La Crosse, Wisconsin.....	24.0	23, 24	11.8	7, 8	7.0	4.8
Dubuque, Iowa.....	16.0					
Davenport, Iowa.....	15.0	30	12.3	4 to 8	8.3	4.0
Keokuk, Iowa.....	14.0	1	14.3	15	10.6	3.7
Saint Louis, Missouri.....	32.0	21	23.7	15, 16	20.8	2.9
Cairo, Illinois.....	40.0	18, 19	51.0	30	32.0	19.0
Memphis, Tennessee.....	34.0	26, 27, 28, 29	35.7	1	27.0	8.7
Vicksburg, Mississippi.....	41.0	30	43.7	1	27.4	16.3
New Orleans, Louisiana.....	13.0	28	14.3	1	9.4	4.9
<i>Ohio River:</i>						
Pittsburg, Pennsylvania.....	22.0	7	22.6	30	3.2	19.4
Cincinnati, Ohio.....	50.0	9	55.8	30	13.0	42.8
Louisville, Kentucky.....	25.0	10	32.9	30	6.8	26.1
<i>Cumberland River:</i>						
Nashville, Tennessee.....	40.0	10	49.3	29, 30	6.2	43.1
<i>Tennessee River:</i>						
Chattanooga, Tennessee.....	33.0	3	52.1	30	6.0	46.1
<i>Monongahela River:</i>						
Pittsburg, Pennsylvania.....	29.0	7	22.6	30	3.2	19.4
<i>Savannah River:</i>						
Augusta, Georgia.....	32.0	1	32.2	27, 28	8.7	23.5
<i>Mobile River:</i>						
Mobile, Alabama.....		14	19.4	2	16.7	2.7
<i>Sacramento River:</i>						
Red Bluff, California.....		17	20.5	1	3.5	17.0
Sacramento, California.....		23	23.8	1	17.5	6.3
<i>Willamette River:</i>						
Portland, Oregon.....		19	9.9	1	4.4	5.5
<i>Colorado River:</i>						
Yuma, Arizona.....		28	20.0	3	16.5	3.5

#### STAGE OF WATER IN RIVERS.

The Mississippi River reached its highest stage during the month at all stations north of Keokuk, Iowa, on the 1st, while at Memphis, Tennessee, and stations south of that place, the river did not pass the danger-point until after the 25th.

The Ohio, on account of the floods of the latter part of March,

continued very high during the first decade of April; its volume of water, being increased by the heavy snow and rain of the 5th and 6th, reached its highest point at Cincinnati, Ohio, on the 9th.

#### ICE IN RIVERS AND HARBORS.

*Connecticut River.*—North Stratford, New Hampshire: owing to the ice gorge which formed on the 2d, the river overflowed, flooding the Grand Trunk Railway tracks and causing a suspension of traffic.

*Israel River.*—Lancaster, New Hampshire: on the 1st the ice in Israel River formed a jam below Mechanic street bridge and caused the river to be partially turned from its course; a part of the current was turned down the streets carrying with it huge blocks of ice, and flooding houses.

*Lake Michigan.*—Chicago, Illinois: navigation was resumed on the 8th. On the 21st vessels forced a passage through the ice in the Strait of Mackinac, and navigation between the upper and lower lakes was commenced, being a fortnight earlier than last year. A large number of steam and sailing vessels cleared from Chicago and Milwaukee for the lower lake ports.

Mackinaw City, Michigan: the strait on the 21st was partially free of ice. The first vessel passed through on that day, bound for Buffalo.

*Lake Huron.*—Alpena, Michigan: the fog and rainy weather caused the ice to break up during the 13th and 14th. A steamer from Detroit, the first vessel this spring, arrived at this port on the 15th.

*Lake Superior.*—Milwaukee, Wisconsin: the first vessel to pass through the strait from the lower lakes arrived on the 24th.

Marquette, Michigan: on the 29th the ice began to move out of the harbor, and navigation was resumed.

*Lake Erie.*—Buffalo, New York: navigation opened on the 15th, the first vessel arriving on that day.

*Lake Ontario.*—Oswego, New York: navigation was resumed at this port on the 1st, the schooner "Speedwell" arriving from Toronto.

*Lake Quinsigamond.*—Worcester, Massachusetts: the ice disappeared from the lake on the 2d, which was two weeks earlier than last year.

*Missouri River.*—Bismarck, Dakota: ice broke up and began moving out of the river on the 8th.

Fort Buford, Dakota: river opened about noon on the 6th.

*Escanaba River.*—Escanaba, Michigan: the high water in the river broke the ice on the 24th. The ice in the bay continued firm.

*Red River of the North.*—Fort Pembina, Dakota: the ice in the river began moving out on the 12th. On the 15th the river was clear of ice.

*Grand Traverse Bay.*—Traverse City, Michigan: ice began moving out of the bay on the 22d; by the 25th the bay was open for navigation.

*Devil's Lake.*—Fort Totten, Dakota: ice broke up on the 22d.

*Mississippi River.*—Saint Paul, Minnesota: the first steamer of the season arrived at this port on the 17th.

*Saint Clair River.*—Port Huron, Michigan: the river was filled with floating ice during the entire month; several vessels which left port during the first half of the month were compelled to return on account of ice. An immense ice gorge, twenty-five feet high, formed at the foot of Lake Huron on the 7th and did not break for several days.

#### FLOODS.

Very heavy rainfalls occurred in the Southern States and Ohio Valley from the 26th of March to the 2d of April; the rains were excessively heavy in eastern Tennessee and northern Alabama, and caused unusually destructive floods concerning which the following reports, arranged by states, are given:

*Alabama.*—Montgomery: the flood of the latter part of March and first of April is considered the most disastrous that has ever occurred in this vicinity. The Alabama River, its tributaries, and all of the numerous rivers and creeks of this state